

# Communications for Low Cost Planetary Missions

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## Abstract

*Does a science-rich planetary mission require a high downlink data rate? Answering in the affirmative tends to increase mission cost, requiring highly directional spacecraft antennas and sophisticated attitude control. However, as the current Galileo experience shows, it is possible to design science-rich mission around a low gain, wide-beam antenna, with a maximum downlink rate of 160 bits-per-second. Applying the techniques presented below to future planetary missions could significantly reduce their complexity and cost.*

*JPL is currently implementing this new downlink design to support the Galileo mission, in response to the failure of the High Gain Antenna. The capabilities to be provided could be useful for other low data rate missions, or mission phases. The new design features on-board data buffering to eliminate short-term peak demand on the downlink, on-board data compression, pre-synchronization recording at the ground stations and automated recovery of pre-acquisition data, ground antenna arraying, improved synchronization, demodulation, and error-correcting coding, and reduced sensitivity to errors in tracking predicts. The ground equipment, currently under development, will become operational in early 1996.*